

UNITED AIRLINES WIND SHEAR INCIDENT

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The information contained in this report of a wind shear incident occurring at Stapleton Airport, Denver, CO, is preliminary in nature. United Flight 633 from Denver to Phoenix departed Denver sometime in the middle of the afternoon. The aircraft was a stretched 727 (aircraft 7647) with JT8D-7 engines. It had the old type flight data recorder which doesn't have quite the resolution that we would all like. The gross weight of the flight was 146,200 lb, which was about 7,000 lb under the maximum allowable takeoff weight. The V1, V2, V2 speeds for the 5° flap takeoff were 139, 139, and 150. They were using runway 35 left, which is 11,500 ft. in length, and by the way, is the same runway where the Continental accident occurred a few years ago.

The weather was high overcast, 83° with a dew point of 38°. The winds were quite variable, we understand, and very squirrely. At the time of takeoff, the winds were 280° at 20 and there was some blowing dust in the area. Denver tower had stopped departures 20 to 40 minutes before this incident, due to wind changes which had gone from north to south and then to west, where it stabilized at about 20 kts. The third aircraft in front of 663 reported a 20 kt airspeed loss on takeoff. The next two airplanes took off and apparently had no indication of wind shear.

Prior to takeoff, the crew had discussed the possibility of wind shear and had decided to use max-rated thrust, although they were 7,000 lb under the maximum allowable gross weight and could have used derated thrust. I think the use of max-rated thrust is important and will turn out to be significant in this incident. At about 120 kts, the crew noticed that the airspeed acceleration slowed or stopped. This airspeed "hang-up" will be important as we analyze this whole incident since it is a very good indication of wind shear. The airspeed increased to VR and the rotation was begun. Apparently the shear hit about that time, or let's say, the second shear, since the first one occurred when they noticed the airspeed aberration on the runway. The Second-Officer of Flight 663 was an instructor and had also been through United's new test program in wind shear. At sometime during rotation, the speed started to decrease. The Second Officer observed the speed decrease and called out a loss of about 20 kts. He then continued making callouts and said something like, "Keep the nose up," or "Keep up the nose," or "Backpressure." The callouts related to the training he received in our new test program. He then went to the vertical speed and called out, "Vertical speed 0, vertical speed 0, vertical speed 0," and about that time, saw the vertical speed jump to over 1,000 fpm, the airspeed increased above 160 kts, and they were out of it.

The crew didn't realize that they had contacted the ILS antennas which were 1,000 ft north of runway 35 left. I heard from the NTSB here today that there was a tire mark about 8 ft above the platform. Also a pipe or antenna, which was about 14 ft above the ground, ended up in the right side of the aircraft by

the cargo door. It tore a hole in the airplane approximately 6" wide and 40" long. There was also a small hole and a scrape of about the same length on the left side of the aircraft. The flight attendant made a statement to the effect that she felt a bump, which would not be abnormal since she is sitting on the aft jump seat near the tail skid, which occasionally contacts the runway. After the crew started to climb out, they found they could not pressurize the aircraft; at that time, they elected to come back and land. They didn't know, until after they were back at the gate, the nature of the problem. By the way, there was no indication of stick shaker. The Second Officer thought the pitch attitude was around 12°. This is obviously all very preliminary information.

QUESTION:

What was the distance to lift off?

RESPONSE:

I can only give you some estimates. Runway 35L is 11,500 ft long. Since 663 was nearly runway limited, they would have been rotating about 3,000 to 4,000 ft from the end of the runway before considering the wind shear. The effect of the tail wind shear would be to move the aircraft closer to the end of the runway, but I can't tell you how much. It will be interesting to ask the Captain and First Officer about their perception. They obviously must have been pretty close to the end of the runway, since they ended up about 14 to 16 ft above the ground when they were 1,000 ft beyond the runway.

QUESTION:

Would you please outline the United Airlines training program?

RESPONSE:

Our current emphasis on wind shear training began as a result of a wind shear encounter in Chicago last year. The Boeing Company has been very helpful in analyzing the data and supplying us with technical information. We have been experimenting in our simulator for about three months with two of their wind shear models and one of ours. We are absolutely convinced that hands-on training is necessary to teach our crews how to recover from inadvertent wind shear encounters.

Again, we are not trying to teach our crews to fly through wind shears. Our number one line of defense has been and will always be to try to avoid this phenomenon. We recognize, however, that in situations like this, when the wind shear is not clear or obvious, our crews must be trained to recover from accidental encounters.

One of the more important items in "hands-on" training is stick force. An aircraft on takeoff is trimmed for V2+10 speed and if 20-30 kts are lost due to wind shear, considerable stick force will be required to keep the nose up. A rough rule of thumb is that a pound of stick force is needed for every knot under trim airspeed. Twenty to thirty pounds of stick force may, therefore, be needed during shears at the very time the pilot would normally be relaxing control wheel pressure as he approaches target pitch altitude. In the case of 663, the pilot probably had to deal with constantly increasing stick force as the airspeed was decreasing, which is different from his normal learned behavior.